

A SYNOPSIS OF NORTH AMERICAN *CORISPERMUM* (CHENOPODIACEAE)¹

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ABSTRACT

Corispermum (Chenopodiaceae) is an Eurasian genus of annual herbs containing members which have become established in the North American flora. The taxonomy of the representatives of this genus occurring in North America has not received careful attention for some time. The most recent taxonomic revision of North American *Corispermum* was actually that of P. C. Standley (1916) in which the following species were recognized: *C. hyssopifolium* L., *C. nitidum* Kitaibel ex Schultes, *C. emarginatum* Rydberg, and *C. villosum* Rydberg. Standley considered the first two species to be introduced and the latter two native. In the present study, herbarium specimens were examined from 14 different herbaria. On the basis of literature and observations of these herbarium specimens, only three species of *Corispermum*, all introduced, are recognized in North America: *C. hyssopifolium* L., *C. nitidum* Kitaibel ex Schultes, and *C. orientale* Lamarck. A study of distributional data acquired from herbarium specimens and state floras suggests that the geographic range for all three species has increased with time.

INTRODUCTION AND METHODS

Corispermum (Chenopodiaceae), a genus of branched, annual herbs, is not native to North America. However, it has become well established in the North American flora. It is commonly found on dunes and sandy hills, beaches or sand flats, and along roadsides and railroad ballasts. The flowers are small, inconspicuous, and arranged in spikes located in axils of the bracts. The "bug-like" fruit, exposed in the bract axils, is often a prominent feature.

The genus is sometimes confused with several other chenopodiaceous taxa. *Kochia scoparia* (L.) Schrader resembles *Corispermum* in its habit, but the calyx of *Kochia* is lobed not more than half-way to the base and forms dorsal, membranous wings in fruit. The calyx of *Corispermum* is scarious, lobed to the base, and does not develop wings. *Salsola kali* L. is also superficially similar to *Corispermum*, but has a spirally coiled embryo with no endosperm, and the tips of the leaves and bracts are commonly spinulose. The embryo of *Corispermum* is annular, surrounding copious endosperm, and the leaves and bracts, though narrowed, are seldom spinulose.

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The genus *Corispermum* contains 50-60 species, 34 of which (along with several varieties) are included in *Flora of the U.S.S.R.* (Iljin, 1936). Although North American taxa of *Corispermum* are few in number, they have not received careful taxonomic attention for some time. A brief summary of the literature relevant to taxa found in North America will serve to support this point.

Schultes (1814) first published *Corispermum nitidum*, which had earlier been described, but not validly published, by Kitaibel. Several superfluous names were subsequently given to this species, including *C. tenue* Link (1820) and *C. microspermum* Host (1827); however, no North American variants have been proposed.

Corispermum hyssopifolium was described by Linnaeus (1753). In 1818 Nuttall published a North American variety of this species, *C. hyssopifolium* var. *americanum*. Later, he elevated this variety to the status of species, viz. *C. americanum* Nuttall (1834). In 1838 W. J. Hooker added several other North American varieties, including *C. hyssopifolium* var. *gracile*, *C. hyssopifolium* var. *robustius*, and *C. hyssopifolium* var. *rubricaulis*. Watson (1874) further increased the list of North American taxa with *C. hyssopifolium* var. *microcarpum*.

Around the turn of the century Rydberg described three supposedly new North American species: *Corispermum villosum* in 1897, *C. marginale* in 1903, and *C. emarginatum* in 1904. Macbride (1918) suggested that *C. villosum* Rydberg and *C. emarginatum* Rydberg actually represented the same taxon which he considered to be merely a variety of *C. orientale* (an Old World species), i.e. *C. orientale* var. *emarginatum* (Rydberg) Macbride. A few years after Rydberg's descriptions, two additional North American species were proposed: *C. imbricatum* Nelson (1909) and *C. simplicissimum* Lunell (1910). Nelson (1909) discussed the introduction of *Corispermum* in North America and indicated that its distribution at that time was "throughout the middle west."

The most recent revision of the North American taxa of this genus was that of Standley (1916), who recognized four species. These species and those names that Standley considered their synonyms are as follows: 1) *Corispermum hyssopifolium*: *C. hyssopifolium* var. *americanum*, *C. americanum*, *C. marginale*, *C. imbricatum*, *C. simplicissimum*; 2) *C. nitidum*: *C. tenue*, *C. microspermum*, *C. hyssopifolium* var. *microcarpum*; 3) *C. emarginatum*; and 4) *C. villosum*. The first two species he thought to be introduced, while the latter two he considered native. Standley also mentioned *C. pilosum*, first described by Rafinesque (1836), but treated it as a doubtful species.

Standley's work, while admirable for its time, leaves many questions unanswered. Herbarium specimens are frequently misidentified, and the number of taxa which should be recognized, as well as the rank which should be accorded them, is uncertain. Furthermore, the native versus introduced status of various taxa is subject to question, and the geographic distribution

given for each species in 1916 has become outdated. The present study is thus an updated taxonomic revision of the North American species of *Corispermum*, including a reconsideration of each species' geographic range.

The conclusions of this study as to the number of taxa of *Corispermum* in North America and their taxonomic rank are based on literature and on personal observations of herbarium specimens. Measurements and other data included in the descriptions are from dried specimens. Over 950 herbarium specimens were examined, including both New and Old World material. The type specimens of most of the proposed North American taxa were examined. In all, specimens were studied from 14 different herbaria. Abbreviations are after Holmgren and Keuken, 1974: F, GH, MIN, MO, MU, NY, OSC, OSU, PH, RM, TEX, UC, US, and UT. The curators of these herbaria are gratefully acknowledged for the loan of specimens of *Corispermum*.

After a study of previous descriptions, the species descriptions herein were written to emphasize those specimens examined which represented the broadest range of morphological variation. Type citations (for all types seen) are included with the synonyms (pertinent to North America) following the correct name of each species.

By surveying state and regional floras and examining labels of herbarium specimens, a more current geographic range was established for each taxon. Specimens were selected for citation on the basis of this distributional survey. They are thus representative of the range of *Corispermum* in North America as it is now known. A card file will be maintained for all specimens examined. Each specimen's card typically includes information on the following: name of specimen, herbarium from which it was received, accession number, collector, collection number, date of collection, and habitat.

GENERIC DESCRIPTION

CORISPERMUM L., Species Plantarum 1:4. 1753.

Branched annual herbaceous plants, frequently slightly woody, glabrous to pubescent, the pubescence of stellate hairs; height of mature plant highly variable in response to climatic and edaphic factors. Leaves green (more rarely tinged with purple), alternate, simple, linear, sessile, entire, often deciduous early, those of the inflorescence reduced to bracts (which are slightly scarios-margined). Flowers perfect, axillary, arranged in spikes; perianth segments sepallid, hypogynous, whitish, scarios, 1—3 (when 3 the posterior segment largest, the 2 anterior ones smaller); stamens 1—3, hypogynous, becoming exserted; ovary superior, the stigmas 2. Fruit achene-like, strongly exserted from perianth, flattened, oval to rounded-oval, often convex on the dorsal surface and concave on the ventral surface; pericarp somewhat hardened and closely surrounding the seed, the margin winged or not. Seed vertical; embryo annular, surrounding copious endosperm. Flowers and fruits developing late summer through autumn.

Type species: *Corispermum hyssopifolium* L., Species Plantarum 1:4, 1753.

The name *Corispermum* is derived from the Greek words *coris*, bedbug, and *sperma*, seed. Vernacular names include: bugseed, bugweed, and tickseed.

SPECIES OF *CORISPERMUM* IN NORTH AMERICA

There are three species of *Corispermum* in North America; all three have been introduced. They are regarded as introduced species on the basis of their similarity to Old World material, the time of their recorded appearance in the North American flora, and their ruderal pattern of distribution. Statements in the literature also support their introduced status. Distributional data accumulated in this study indicate, in comparison with previously available information, an increasing range for all three species of *Corispermum* in North America with time.

- A. Fruit conspicuously wing-margined.
 - B. Spikes dense; bracts closely overlapping and all at least as broad as the fruit. 1) *C. hyssopifolium*
 - B. Spikes loose; bracts not distinctly overlapping, especially along lowermost portion of spike, and at least the lower bracts much narrower than the fruit. 2) *C. nitidum*
- A. Fruit lacking conspicuous wing-margins. 3) *C. orientale*

1. *CORISPERMUM* *HYSSOPIFOLIUM* L., Sp. Pl. 1:4. 1753. (Phototype: Linnaean Herbarium, IDC No. 12!)

- C. americanum* Nuttall, Trans. Amer. Philos. Soc. 5:165. 1834.
- C. hyssopifolium* var. *americanum* Nuttall, The Genera of North American Plants 1:3. 1818. (Type: Nuttall s.n., PH!, labeled *C. hyssopifolium* var. *pubescens*)
- C. hyssopifolium* var. *gracile* Hooker, Flora Boreali-Americana 2:125. 1838.
- C. hyssopifolium* var. *robustius* Hooker, Flora Boreali-Americana 2:125. 1838.
- C. hyssopifolium* var. *rubricaulis* Hooker, Flora Boreali-Americana 2:125. 1838.
- C. imbricatum* A. Nelson, Coulter's New Manual of Botany of the Central Rocky Mountains, revised ed., 163. 1909. (Type: Elias Nelson 733, RM!)
- C. marginale* Rydberg, Bull. Torrey Bot. Club 30:247. 1903. (Holotype: Herrick s.n., NY!)
- C. simplicissimum* Lunell, Amer. Midl. Naturalist 1:207. 1910. (Type: Lunell 395, MIN!)

Stems slender to stout, glabrous to pubescent, the pubescence sparse to very dense. Leaves green, broadly linear, 0.5–9.0 cm long, 1.0–5.0 mm wide. Bracts linear to ovate, closely overlapping, at least as wide as fruit, as long as or longer than fruit, narrowed at the apex. Spikes densely flowered, up to 9 cm long, the spike axis not exposed. Fruits 1.0–4.0 mm wide, strongly wing-margined, the wing pale, up to 0.5 mm wide.

The specific name is derived from the Greek *hyssopos*, an aromatic herb. Type locality: along the Volga River, U.S.S.R.

The North American specimens of *Corispermum hyssopifolium* do not

differ distinctly from Old World specimens of this species. Also, previous descriptions of *C. hyssopifolium* from both North America and the Old World are quite similar. Thus, the various specific and varietal names which have been recognized as applying to distinct taxa are reduced to synonyms.

Representative specimens: CANADA: ALBERTA: Bonnyville, railway gravel, 23 Sep 1939, *Grob 1099* (TEX, UC); Cardston, gravel soil, Lee's Creek, 8 Aug 1914, *Moodie 206* (NY); Craigmyle District, in grain crop, 30 Aug 1942, *Brinkman 5326* (OSC, RM); Fort Saskatchewan, 4 Sep 1939, *Turner 1574* (GH). MANITOBA: Glenboro, 35 mi SE of Brandon, prairie sandhills, 24 Aug 1951, *Scoggan 10545* (GH); Sidney, three mi E of here, 5 Sep 1954, *Rosbach 78* (UC). ONTARIO: Thunder Bay District, railroad ballast, north shore of Lake Superior, 13 Aug 1937, *Hosie, Losee, and Bannan 1461* (GH); Rainy River District, on railroad ballast, prostrate, 15 Aug 1961, *Garton 9438* (MIN); Welland Co.: Point Abino, 23 Aug 1886, *Coville s.n.* (MO). QUEBEC: Abitibi Co.: Villemontel, railroad ballast, 31 Aug 1952, *Baldwin and Breitung 4320* (GH); Labelle Co.: 8 Oct 1949, *Giroux s.n.* (MU). NORTHWEST TERRITORIES: Mackenzie District, disturbed sand along roadside on mainland one mile south of Fort Simpson Island, 3 Aug. 1955, *Cody and Matte 9130* (F, GH, MIN); Mackenzie District, five miles upstream from Norman Wells, rare on gravel beach of Mackenzie River, 27 Jul 1953, *Cody and Gutteridge 7603* (F); Mackenzie District, vicinity of Fort Simpson, windblown sand along river channel, 22 Aug 1939, *Raup and Soper 9868* (MIN, RM).

MEXICO: State of Chihuahua: Quarry hills, 1912, *Stearns s.n.* (MO).

UNITED STATES: ALASKA: Porcupine River, 15 mi from mouth, 22 Aug 1926, *Murie 49* (US); Yukon River between Rampart and Tanana, 9 Aug 1932, *Palmer 13* (US). ARIZONA: Navajo Co.: Holbrook, 4 Oct 1897, *Zuck s.n.* (US). CALIFORNIA: Inyo Co.: scattered on lower slopes of sand dunes at mouth of Marble Canyon, 13 May 1955, *Roos 6361* (UC). COLORADO: Jackson Co.: San Luis Valley, 1875, *Brandege s.n.* (UC); Larimer Co.: North Park, 5 Sep 1899, *Osterhout 3201* (RM); Moffat Co.: three mi NW of Sunbeam, sand blow-out, 2 Sep 1970, *Weber 14246* (US, UT); Weld Co.: 1909, *Jobnston 618* (RM). IDAHO: Kootenai Co.: near Horse Plains Mountain, 25 Aug 1895, *Leiberg 1602* (MO, NY, UC); Nez Perce Co.: sandy island in Clearwater River, opposite Lewiston, 12 Oct 1924, *St. John 6792* (NY, UC). ILLINOIS: Cook Co.: Evanston, Sep 1888, *Johnson s.n.* (UC); Lake Co.: Winthrop Harbor, 30 Aug 1909, *Gates 3226* (F). INDIANA: Howard Co.: Kokomo, 1942, *Ek s.n.* (GH, MO, MU, NY, TEX, UC); La Porte Co.: Michigan City, 30 Sep 1920, *Benke 2749* (F); Porter Co.: Ogden Dunes, 4 Oct 1930, *Standley 57479* (F). IOWA: Harrison Co.: moist sandy alluvium along Missouri River, 9 Aug 1952, *Fay 4703* (UC). MICHIGAN: Berrien Co.: in sandy soil close to Lake Michigan in Bridgman, 20 Sep 1952, *Suink 1891* (F); Leelauna Co.: on open and exposed places, 13 Sep 1917, *McCoy 1037* (F); Manistee Co. Manistee, in sand on lake shores, 21 Aug 1882, *Morong s.n.* (NY); Mason Co.: sand-flats at Ludington, shore of Lake Michigan, 2 Oct. 1949, *McVangb 11198* (MO). MINNESOTA: Polk Co.: dry sand about one mi SW of Fertile, 22 Aug 1947, *Terrell 1827* (MIN, US); Roseau Co.: ballast of railroad one and three tenths mi N of Longworth, 2 Aug 1939, *Moore and Moore 11370* (MIN, NY, UC); St. Louis Co.: Duluth, Minnesota Point, 6 Sep 1936, *Lakela 1841* (F, NY, PH); Todd Co.: Staples, sandy soil, 29 Aug 1911, *Cbandonnet s.n.* (MO). MISSOURI: Clay Co.: Quo River, rare, 21 Sep 1895, *Mackenzie 1053* (NY); Perry Co.: Wittenburg, sand dunes along Mississippi River flood plain, 31 Jul 1934, *Steyermark 14056* (NY); St. Louis Co.: Chain of Rocks, Missouri River sand dunes, 5 Oct 1933, *Kellogg s.n.* (MO). MONTANA: Cascade Co.: Great Falls, Aug 1895, *Anderson s.n.* (MU, NY); Dawson Co.: sandy soil near Glendive, 6 Sep 1892, *Sandberg, MacDougal and Heller 1013* (F, GH, NY, US). NEBRASKA: Kearney Co.: Minden, sandy soil, 20 Sep 1907, *Hapeman s.n.* (MIN); Lancaster Co.: Lincoln, Aug 1898, *Williamson s.n.* (PH). NEW JERSEY: Nassau Co.: Bayville, 7 Jul 1935, *Murray s.n.* (MU). NEW YORK: Erie Co.: Buffalo, *Clinton s.n.* (F, NY). NORTH DAKOTA: McHenry Co.: sand blow-out, four to five mi W of Denbigh, 13 Sep 1932, *Hutchkiss 4505* (US); Pierce Co.: Rugby, railroad, 30 Jul 1912, *Bergman 2588* (MIN, MO); Richland Co.: Leonard, sand dunes, 19 Sep 1937, *Stevens 79* (F, NY); Stark Co.: Dickinson, on river bank, 18 Jul 1911, *Bergman 1257* (F). OHIO: Huron Co.: freight yards, Jul 1915, *Shuman 965.1* (OSU). OREGON: Baker Co.: 28 Nov 1952, *Wright s.n.* (OSC); Josephine Co.: Grants Pass, Sep 1887,

Houell s.n. (OSC); Lake Co.: near Alkali Lake, 18 Jul 1933, *Thompson 12,172* (F, GH, MO, NY, UC, US); Wasco Co.: along Columbia River opposite The Dallas, 1915, *Evans s.n.* (OSC). SOUTH DAKOTA: Fall River Co.: sandbars Cheyenne River, 12 Sep 1924, *Over 15943* (UC); Walworth Co.: sandbars Missouri River, 28 Aug 1921, *Over s.n.* (US). TEXAS: Webb Co.: Laredo, Rio Grande River, 1-20 Aug 1879, *Palmer 1165* (MO). UTAH: Juab Co.: Lyndyl sand dunes, 8 Sep 1965, *Welsb and Moore 5127* (MIN, NY); Millard Co.: juniper association, sand dune, 18 Sep 1926, *Garrett 1010* (RM). WASHINGTON: Douglas Co.: jct. of Crab and Wilson Creeks, 25 Jul 1893, *Sandberg and Leiberg 309* (F, GH, MO, NY, UC, US); Grant Co.: sandy sagebrush plains near Quincy, 15 June 1931, *Thompson 6764* (GH, MO); Klickitat Co.: sandy banks of the Columbia River, 11 Sep, 20 Oct 1893, *Suksdorf 1385* (F, GH, MIN, MO, NY, UC, US); Whitman Co.: sandy bank of Snake River at Wawawai, 15 Oct 1939, *Owenbey and Owenbey s.n.* (MIN, NY, RM, TEX, UC). WISCONSIN: Kenosha Co.: moist prairie along Lake Michigan, 16 Oct 1961, *Illis 19,461* (TEX); Milwaukee Co.: Milwaukee, sandy lake beach, 1866, *Lapham s.n.* (MO); Racine Co.: Racine, 10 Sep 1878, *Davis 41* (MIN, MON, OSU); Sheyboygan Co.: sandy beach of Lake Michigan, 10 Sep 1956, *Illis and Koepfen 8247* (UC). WYOMING: Sweetwater Co.: on sand dune one mi W of Steamboat Mountain, 2 Sep 1936, *Lang 99* (RM).

2. *CORISPERMUM NITIDUM* Kitaibel ex Schultes, *Österreichs Flora*, revised ed., 1:7. 1814.

C. hyssopifolium var. *microcarpum* Watson, *Proc. Amer. Acad. Arts* 9:122. 1874. (Lectotype: *Fendler 711*, MO!)

C. microspermum Host, *Flora Austriaca* 1:318. 1827

C. tenue Link, *Jahrbücher der Gewächskunder* 1:27. 1820.

Stems slender, glabrous or more rarely sparsely pubescent, the pubescence denser in younger plants. Leaves green, narrowly linear, 0.5–6.0 cm long, 0.5–3.0 mm wide. Bracts commonly not imbricate, exposing the spike axis, only rarely slightly overlapping at apices or slightly telescoped in immature plants, the lower bracts much narrower than the fruit, frequently longer than fruit. Spikes not congested, up to 15 cm long. Fruits green to black, 1.0–3.0 mm wide, strongly wing-margined, the wing pale, up to 0.3 mm wide.

The specific name is from the Latin *nitidus*, bright.

Type locality: Hungary.

This plant is recognized in both the Old and New World as an excellent source of forage for cattle. Many members of the Chenopodiaceae, including *Corispermum*, are at least somewhat halophytic or salt-tolerant. As a result, this plant can establish itself in many areas where other species cannot. It is especially common along roadsides and in waste places.

The selection of the lectotype of *Corispermum hyssopifolium* var. *microcarpum* Watson is made herein from among the syntypic collections cited by Watson (1874).

Representative specimens: CANADA: MANITOBA: Grande Clariete, W of Hartney, dry sandy clearings in dune area, 29 Jul 1951, *Scoggan 10142* (MIN); St. Lazare, 70 mi NW of Brandon in valley of Assiniboine River opposite mouth of Qu'Appelle River, prairie sandhills, 7 Aug 1951, *Scoggan 10246* (GH, MIN). ONTARIO: Rainy River District, on panne of sand dunes, 1 Aug 1961, *Garton 9148* (UC); Thunder Bay District, waste ground, staff parking lot Lakehead University, 10 Aug 1972, *Garton 15175* (UC).

MEXICO: State of Chihuahua: sand dunes, 10-19 Oct 1935, *LeSueur 285* (F, MO, TEX, UC).

UNITED STATES: ARIZONA: Apache Co.: Adamana, 6-15 Aug 1903, *Griffiths 5074* (US); Coconino Co.: marsh near Tuba City, 27 Sep 1935, *Kearney and Peebles 12875* (F); Navajo Co.: Holbrook, 6 Sep 1883, *Rusby s.n.* (F, NY, US). COLORADO: Boulder Co.: plains and foothills near Boulder, Oct 1902, *Tweedly 5088* (NY, RM); Denver Co.: Denver, along the Platte River, 19 Aug 1878, *Jones 655* (MO); Fremont Co.: Canon City, Sep 1873, *Brandegee 841* (MO, NY, UC); Weld Co.: New Windsor, 14 Sep 1896, *Osterhout 1156* (RM). ILLINOIS: Cook Co.: Chicago, 14 Sep 1954, *Thieret 1033* (F); Menard Co.: Athens, 1861, *Hall s.n.* (MO). INDIANA: Lake Co.: in sandy beach along railroad tracks E of Indiana Harbor, 23 Sep 1906, *Deam 1746* (NY, RM, US); La Porte Co.: Michigan City, 7 Sep 1903, *Lansing, Jr. 1886* (F). KANSAS: Barber Co.: Medicine Lodge, bottom of dry ditch, 12 Sep 1890, *Smyth 300* (GH, NY); Greeley Co.: Tribune, 2 Sep 1893, *Reed s.n.* (MU, NY, US); Logan Co.: sandy soil, 27 Jul 1895, *Hitchcock 441* (GH, MO, NY, RM, US); Rooks Co.: Rockport, 1889-1894, *Bartholemew s.n.* (NY). MICHIGAN: Berrien Co.: Benton Harbor, sandy shore of St. Joseph River, 18 Sep 1910, *Lansing 2884* (GH); Calhoun Co.: W of Albion, 22 Sep 1906, *Barr s.n.* (F); Mason Co.: Ludington, Hamlin Lake, moving dune, 14 Sep 1910, *Chaney 211* (F, GH, NY, US). MINNESOTA: Clearwater Co.: Squaw Lake, 25 Aug 1936, *Grant 6830* (MIN); Goodhue Co.: sandy soil Cannon Falls, Jul 1893, *Scofield s.n.* (GH); Hennepin Co.: Minneapolis, Jul 1890, *Aiton s.n.* (RM); Ottertail Co.: Battle Lake, Aug 1892, *Sbeldou s.n.* (MIN, MO, OSU, UC). NEBRASKA: Hooker Co.: on Middle Loup River near Mullen, 17 Jul 1893, *Rydberg 1647* (NY, US); Kearney Co.: Minden, 30 Aug 1891, *Hapeman s.n.* (RM); Thomas Co.: Middle Loup River near Nattick on sandy bank, 11 Sep 1893, *Rydberg 1647* (NY, US). NEW MEXICO: Dona Ana Co.: Mesilla Valley, 20 Sep 1907, *Wootton and Standley 3154* (F, MIN, MO, OSC, RM); Otero Co.: dunes of quartz sands, 14 mi W of Tularosa, 13 Oct 1931, *Bram s.n.* (UC); San Juan Co.: Farmington, 8 Aug 1904, *Wootton 2764* (US); Socorro Co.: 27 Aug 1965, *Hess, Dunn and Spellman 419* (GH). NEW YORK: Monroe Co.: East Rochester along railroad track, 15 Sep 1921, *Baster 5499* (GH, NY). NORTH DAKOTA: Ransom Co.: Anselm, 30 Aug 1918, *Stevens s.n.* (MIN). OHIO: Ross Co.: Chillicothe, B & O Railroad, 12 Sep 1965, *Bartley 1078.1* (NY, OSU). OKLAHOMA: Canadian Co.: floodplain of the South Canadian River E of Bridgeport, 6 Oct 1940, *Waterfall 2507* (MO, NY); Cleveland Co.: sand near river, 10 mi NW of Norman, 8 Sep 1946, *Goodman 4080* (MO, RM); Woods Co.: on sandy bank of Salt Fork River near Alva, 24 Sep 1913, *Stevens 2849* (GH, MIN, MO, NY, US). SOUTH DAKOTA: Clay Co.: sandy flood plain of Vermillion River, 25 Sep 1914, *Oser 5110* (US); Harding Co.: Cave Hills, steppe, 1 Sep 1912, *Visber 668* (F). TEXAS: El Paso Co.: on dunes about 10 mi NW of El Paso, W of Franklin Mountains, 30 Oct 1962, *Correll 26570* (GH); Hemphill Co.: gravel dikes in sand hills two mi S of Glazier, 8 Oct 1965, *Rowell 10919* (GH); Lipscomb Co.: deep sands of sand hills one mi S of Higgins, 8 Oct 1965, *Rowell 10908* (GH); Wheeler Co.: flood plain, north fork of Red River, 15 Sep 1950, *Tharp and Miller 51-376* (MIN, RM, TEX). UTAH: Emery Co.: vicinity of Molly's Castle, San Rafael Desert, 15 Aug 1957, *Mitchell and Grover s.n.* (NY); Salt Lake Co.: Bingham Canyon, 27 Aug 1879, *Jones 1341* (F, MIN, NY, RM, US); San Juan Co.: Lost Canyon, 15 Sep 1964, *Welsb, Moore, and Olsen 3763* (MIN). WASHINGTON: Grant Co.: dry sand SW of Moses Lake, 25 June 1921, *St. John, Courtney, and Parker 4948* (GH); Klickitat Co.: high sandy river bank, 16 Jul 1895, *Suksdorf 3673* (GH); Whitman Co.: woody bank of Snake River, 4 Oct 1924, *St. John s.n.* (UC). WISCONSIN: Racine Co.: 10 Sep 1878, *Davis s.n.* (F); Sheboygan Co.: occasional on dunes and sandy beaches, Lake Michigan area, 3 Sep 1939, *Pohl 1401* (PH).

3. *CORISPERMUM ORIENTALE* Lamareck, Encyclopédie méthodique botanique 2:110, 1786.

- C. emarginatum* Rydberg, Bull. Torrey Bot. Club 31:404. 1904. (Type: *Aven Nelson 4282*, GH, MO, NY, RM!)
- C. orientale* var. *emarginatum* (Rydberg) Macbride, Contr. Gray Herb. new series, 53:12. 1918.
- C. villosum* Rydberg, Bull. Torrey Bot. Club 24:191. 1897. (Lectotypic collection: *Rydberg 2623*, NY, US!)

Stems glabrous or more rarely sparsely pubescent. Leaves linear, green

or occasionally tinged with purple, 0.5–6.0 cm long, 0.5–3.5 mm wide. Bracts overlapping, exposing the axis along the lower portion of the inflorescence, at least as broad as and commonly slightly longer than the fruit, narrowed at apex. Spikes densely flowered, up to 13 cm long. Fruits 1.0–3.5 mm wide, lacking distinct wing margins though the margin of the fruit may be sharpened or acute.

The specific name is derived from the type locality: "in Oriente." The type specimen is maintained in Paris (P).

The selection of the lectotypic collection of *C. villosum* was actually made by Standley (1916) when he chose Manhattan, Montana, as the type locality.

Immature specimens of *C. orientale* and *C. hyssopifolium* are somewhat similar in appearance; however, *C. hyssopifolium* can be distinguished from *C. orientale* in immature stages by the degree of pubescence on the inflorescence. The inflorescence of *C. hyssopifolium* (especially in younger plants) tends to be very densely pubescent, whereas that of *C. orientale* is seldom pubescent, even during early stages of development.

The New World and Old World specimens of *C. orientale* are virtually identical. Although Macbride (1918) was correct in proposing that *C. villosum* and *C. emarginatum* are not native species, that they do in fact represent the same taxon, and that they are actually *C. orientale*, he suggested that North American specimens differed enough from Old World material to be recognized as a distinct variety, viz. *C. orientale* var. *emarginatum* (Rydberg) Macbride. Careful attention was given to Macbride's description, but no distinguishing features were observed among the specimens which would support the proposed variety. Consequently, only one nonwing-margined species (without varieties) should be recognized among the North American taxa of *Corispermum*.

Representative specimens: CANADA: ALBERTA: Cardston, vicinity of Calgary, 8 Aug 1914, *Moodie* 6 (F); Fort Macleod, 6 Aug 1895, *Macoun* 12,935 (F). ONTARIO: Lambton Co.: Port Franks, 15 Oct 1906, *Dodge* s.n. (MU, TEX); Rainy River District, gravel railroad ballast, 15 Aug 1961, *Garton* 9383 (MIN); Thunder Bay District, Port Arthur, railroad ballast, 6 Sep 1952, *Garton* 2209 (MO). SASKATCHEWAN: Medicine Hat, 9 Aug 1895, *Macoun* 12936 (NY); Webb, sand dunes, 29 Aug 1947, *Breitung* 5842 (MO). MEXICO: State of Chihuahua: much branching forming sand tuft, 1852, *Thurber* s.n. (F).

UNITED STATES: ARIZONA: Apache Co.: Canyon de Chelly National Monument, dry sandy areas in canyon, 17 May 1955, *Demaree* 38425 (UT); Coconino Co.: Flagstaff, 5 Sep 1943, *Schallert* s.n. (MO, RM). COLORADO: Chaffee Co.: Salida, 31 Aug 1892, *Mulford* s.n. (MIN); El Paso Co.: Colorado Springs, 11 Aug 1873, *Porter* s.n. (RM); Gunnison Co.: Gunnison, along irrigation ditches and adjacent dry ground, 12 Sep 1901, *Underwood* and *Selby* 401 (NY); Moffat Co.: infrequent on dry sandy areas one-quarter mi W of Echo Park Campground, 7 Sep 1961, *Holmgren, Jensen, and Reveal* 438 (NY). MICHIGAN: Marquette Co.: Marquette, 1 Sep 1923, *Sherff* s.n. (F). MINNESOTA: Clay Co.: Dilworth, railroad yards, 22 Sep 1958, *Stevens* 2033 (MIN, UC); Lake of the Woods Co.: Morris Point (Oak Point), growing on sandy shore, 29 Aug 1939, *Moore* and *Moore* 12226 (GH, RM); St. Louis Co.: Duluth, in gravel common on the beaches of the lake and bay, 22 Aug 1936, *Lakela* 1770 (NY, US). MISSOURI: Clay Co.: common, 21 Sep 1895, *Mackenzie* 422 (MO, NY); Jackson Co.: Kansas City, sands, 24 Sep 1909, *Bush* 5923 (GH, MIN, MO, NY, US); Ray Co.: sandbars and alluvial depressions along Missouri River, 5.5 mi SE of Henrietta, 9 Oct 1956, *Steyermark* 83150 (MO). MONTANA: Daw-

son Co.: Colgate, 6 Sep 1892, *Sandberg, MacDougal, and Heller 1013* (US); Hill Co.: Hayre, 4 Sep 1903, *Blankinsbip s.n.* (RM). NEW MEXICO: Bernalillo Co.: Albuquerque, Aug 1884, *Jones 4936* (NY); Sandoval Co.: San Ysidro, 18 Aug 1926, *Arsene and Benedict 16476* (F, US); Santa Fe Co.: Santa Fe, 10 Sep 1881, *Engelmann s.n.* (MO); Valencia Co.: Grants, 1 Oct 1884, *Jones 4936* (US). NORTH DAKOTA: Billings Co.: Medora, in sand near top of butte, 17 Sep 1911, *Bergman 1284* (RM); Cass Co.: Fargo, in sand on railroad grade, 12 Sep 1942, *Stevens 669* (MO, NY, UC); Morton Co.: Mandan, 10 Sep 1891, *Wright 610* (NY, RM). OREGON: Walla-Walla Co.: 17 Sep 1894, *Leiberg 912* (GH, MO, NY, US). TEXAS: Wilbarger Co.: Sep 1880, *Boll 1232* (F). WISCONSIN: Ashland Co.: railroad tracks, 10 Sep 1927, *Penocke 16282* (MO). WYOMING: Albany Co.: Laramie, saline creek bank, 22 Aug 1913, *Machride 2699* (MO); Sweetwater Co.: sand dunes near Steamboat Mountain, 1 Sep 1936, *Owenbey and Lang 1122* (MO); Uinta Co.: Diamondville, on the loose railroad grades, *Nelson 8109* (GH, MIN, MO, NY, RM, US).

DOUBTFUL SPECIES

Corispermum pilosum Rafinesque, *New Flora and Botany of North America* 4:46. 1836.

Originally collected by Kin (or Kinn) in Florida (Rafinesque, 1836), no specimens of this species have been collected in recent years. Standley (1916) suggested that this plant may be *C. hyssopifolium* L., if it was in fact correctly placed in this genus.

DISTRIBUTIONAL HISTORY OF *CORISPERMUM* IN NORTH AMERICA

The increased distribution of all three species of *Corispermum* with time appears to be associated with two major factors of seed dispersal, waterways (rivers, streams, lakes) and transport along thoroughfares. A third, but relatively minor (operating within a smaller range), factor is wind. Wind, particularly for those populations which have become established on sand dunes, could account for seed dispersal across a distance of several miles.

In Canada the range of *Corispermum* appears to have increased northward and westward with time. This statement is based on herbarium specimens examined. Many of these Canadian specimens were collected on or near military camps, and the increase in range of *Corispermum* may have accompanied the establishment of these camps.

The range of *Corispermum* in Mexico seems fairly limited; however, all three species are present and apparently have been for some time (i.e. since at least 1912 for *C. hyssopifolium*, 1935 for *C. nitidum* and 1852 for *C. orientale*). Thus, it is probable that their distribution in Mexico is greater than our findings indicate. This could be a result not only of the herbaria selected for this study, but also of the general incompleteness of representative herbarium material available from this region.

On the basis of specimens examined it is not possible to indicate a certain point of origin for each species in the United States nor exact pathways of establishment. However, during the course of this study several locations of early establishment became apparent. Again, these are not necessarily indications of points of origin, but are only suggested population centers

for each species early in the history of *Corispermum* in the United States.

It is postulated that the earliest representatives of the genus (i.e. *C. hyssopifolium*) in the United States became established just prior to 1818 (Nuttall), somewhere in the midwest. The establishment of all three species since that time has been successful throughout a major portion of the country. Populations of both *C. nitidum* and *C. hyssopifolium* in the Great Lakes region and in several states along the Missouri River were some of the earliest populations of *Corispermum* collected for herbaria. From these centers, the species' rapid spread would have been facilitated by major waterways. Based on numbers of herbarium specimens examined, both *C. nitidum* and *C. hyssopifolium* appear better established than *C. orientale*, and *C. hyssopifolium*, of the first two, is probably the more widespread. Earliest specimens of *C. orientale* were from New Mexico and Texas in the late 1800's (circa 1880). However, *C. orientale* is now rather widely distributed throughout the United States. The establishment of *C. orientale* in many areas seems to be associated with transport routes, particularly railways, and is thus more recent than that of the other two species. Consequently, it is postulated that, with time, *C. orientale* will become as successful in North America as *C. nitidum* and *C. hyssopifolium*.

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